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APPRAISAL OF ONE-WAY STREET SYSTEM
IN SACRAMENTO, CALIFORNIA

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HIGHWAY DIVISION

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APPRAISAL OF ONE-WAY STREET SYSTEM
in
SACRAMENTO, CALIFORNIA

D. J. Faustman, City Traffic Engineer, Sacramento

California, like many other states in the nation, is facing a transportation crisis through its inability to provide an adequate street and highway system to accommodate the phenomenal increase in traffic movement. The problem is particularly acute in urban areas since it is in these areas that traffic concentrations are the greatest and the new facility construction costs the highest. Any method, therefore, of improving traffic conditions in urban areas quickly and inexpensively is deserving of close scrutiny.

The one-way street offers to the traffic and highway engineer an exceedingly effective tool for facilitating traffic movement. Although it is not a panacea for all traffic ills, and certainly should not be considered a final solution, it offers many advantages.

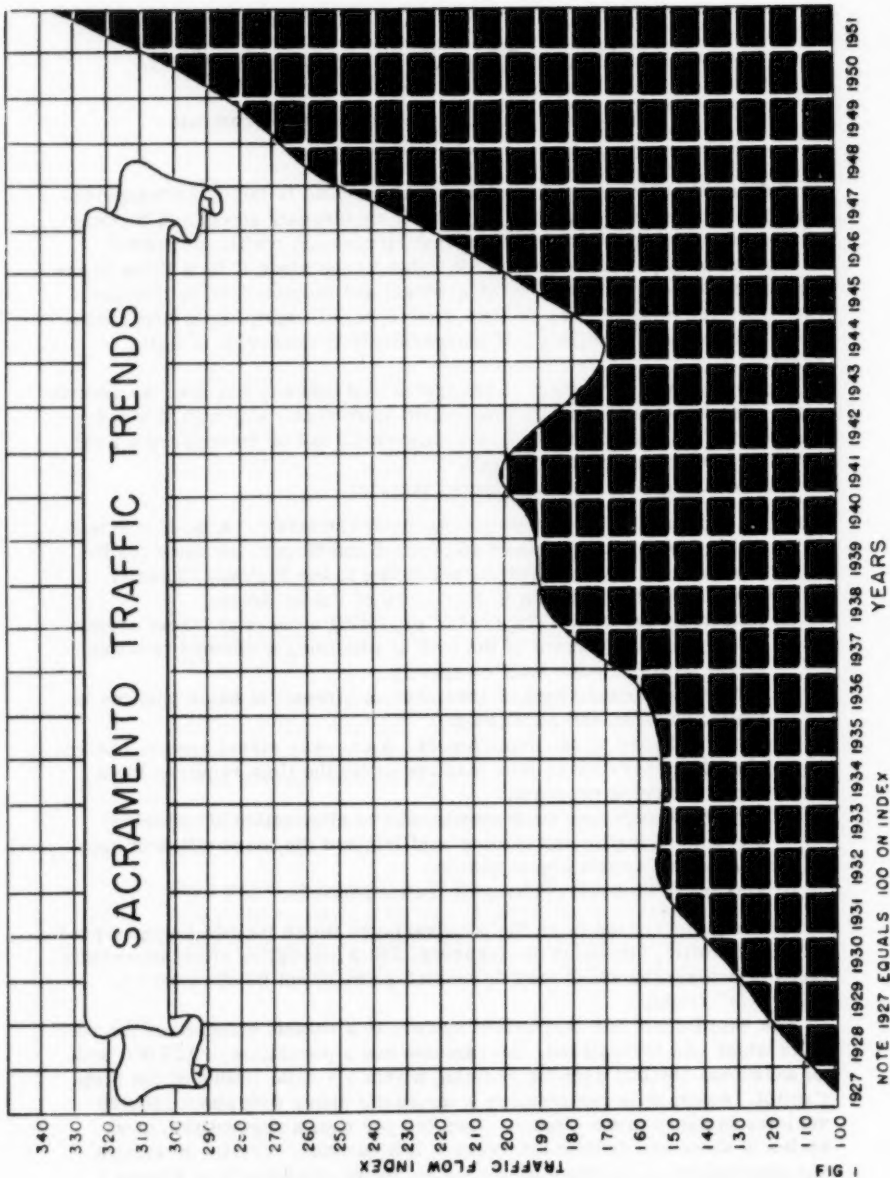
The advantages of one-way streets include:

1. An increase in the carrying capacity of the street. A 50-foot street will accommodate between 45 percent and 60 percent more traffic than with two-way operation, according to the Highway Capacity Manual published by the U. S. Bureau of Public Roads.
2. Relatively low cost. The cost of providing a one-way street system is only about 2 percent of the cost of providing a widened two-way street with the same traffic capacity.
3. Reduction of most types of accidents as a result of basic changes in traffic patterns and conditions.
4. Speed and ease of accomplishment. A one-way street system can be placed in operation in less than one-tenth the time required for a street widening program.
5. Higher average operating speeds, due to elimination of opposing streams of traffic and turning conflicts and the more efficient operation of the traffic signal system.
6. Flexibility in meeting changing traffic patterns.

These gains far outweigh the disadvantages which include longer travel for some traffic, confusion to strangers, and a disruptive effect on certain types of businesses which may be located so as to not be attractive to "drive-in" trade.

The Sacramento one-way street system is a notable example of the results which can be achieved. Sacramento has a population of 155,000 with an additional 100,000 persons residing within a 7-mile radius of the State Capitol. Automobile registration is unusually heavy with about 150,000 vehicles in Sacramento County. Thus the per capita registration of vehicles is about one vehicle for every 1-2/3 persons. Traffic movement has skyrocketed since the end of 1945 as shown graphically in Figure 1.

A temporary one-way street system was initiated in Sacramento in



August of 1948 to accommodate traffic detoured by closure of the 12th Street subway for reconstruction. For about 13 months all traffic entering and leaving the northern city limits utilized the one-way street system on 15th and 16th Streets. Upon the completion of the subway and the reopening of 12th Street, one-way traffic was abandoned. Traffic conditions on 16th Street, as well as many other city streets, had deteriorated to a point where the public was clamoring for action and as a result, the City Council, acting upon recommendations of the traffic engineer, adopted a comprehensive plan of one-way streets in April, 1950. Installation of the plan was begun on a permanent basis during the summer of 1950 and completed in December, 1952. This system is shown in Figure 2. The system consists of 8 pairs of streets, a total of 26.4 miles. The cost was \$90,000 of which about half was for additional traffic signals and the balance for signing, striping and other facilities. The cost of a somewhat comparable widened two-way street system would have been in excess of \$4,000,000.

In designing the one-way street system, consideration was given to the use of one-way streets as a stop-gap measure pending the ultimate construction of freeways. It is noted in Figure 2 that the system is integrated into the proposed system of freeways and major highways for the Sacramento area. This factor, coupled with a consideration of origin-destination patterns, street widths, geographical layout, traffic trends, etc., governed the development of the plan. The older areas of the city with a grid street system were most easily adapted to one-way streets, whereas in the newer areas lack of parallel streets along the principal arteries ruled out any extensive use of one-way streets. As additional state highway and city funds become available, it is anticipated that the one-way streets will be replaced by freeways, either following the same alignment or so placed so as to serve the same traffic. The one-way street, however, is not the final answer, and the recent report "California State Highways" made by the Automotive Safety Foundation points out that this one-way plan can be relied on only for another 10 years. Such a statement is not necessarily true of a smaller community where traffic volumes in the foreseeable future are not sufficiently heavy to overtax the capacity of the streets.

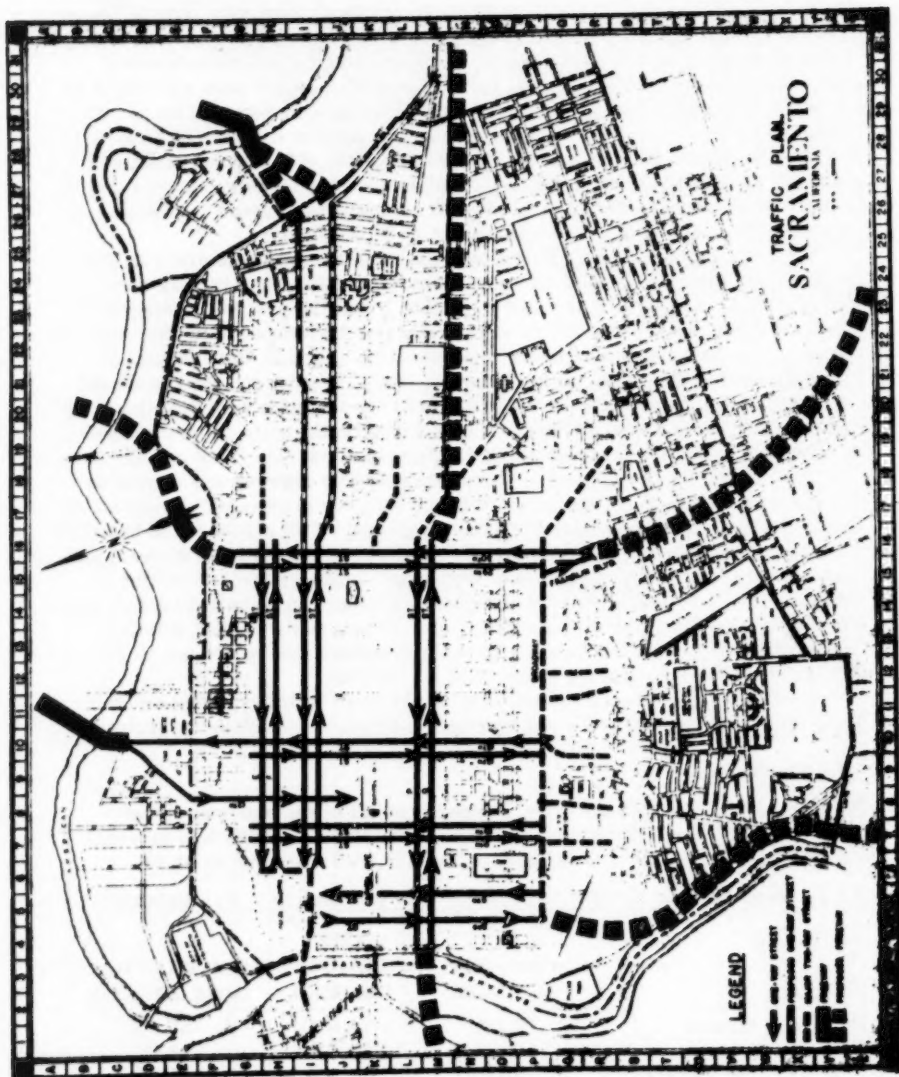
Studies have been made of the results achieved by the one-way street system in Sacramento and are described in detail in the following sections:

Traffic Volumes

Overall traffic volumes have increased on all of the one-way street pairs as compared with the operation of these streets as two-way streets. The total overall increase in average 24 hour traffic volume is 35.2%.

Average 24 Hour Traffic Flow Under One-Way and Two-Way Operation

<u>Street</u>	1952		<u>Percent Change Over Two-Way</u>
	<u>Two-Way Operation</u>	<u>One-Way Operation</u>	
E and F Streets	9,361	14,551	✓ 55.5%
H and I Streets	18,081	22,691	✓ 25.5%
9th and 10th Streets	12,490	14,349	✓ 14.9%
15th and 16th Streets	27,828	30,454	✓ 9.4%
29th and 30th Streets	2,724	13,424	✓ 392.8%
12th Street	19,321	25,934	✓ 34.2%
Total			✓ 35.2%



Accident Experience

Comparison of the combined accident rate for all types of motor vehicle accidents on the various one-way street pairs under one-way and two-way operation indicates an overall reduction of 22.9% under one-way operation.

Accident Rate Under One-Way and Two-Way Operation

Street	Accidents per Million Vehicle Miles		
	Two-Way Operation	One-Way Operation	Percent Change Over Two-Way
E and F Streets	20.4	13.3	- 34.8%
H and I Streets	26.1	14.5	- 44.4%
9th and 10th Streets	28.9	24.1	- 16.6%
15th and 16th Streets	21.5	20.0	- 7.0%
29th and 30th Streets	59.3	20.9	- 64.8%
12th Street	19.7	17.9	- 9.1%
Total			- 22.9%

The reduction in accidents on one-way streets is not just luck, but results from basic changes in traffic pattern and conditions on a one-way street. Among the more important changes are:

1. Reduction in conflicting movements at intersections.
2. Elimination of head-on collisions.
3. Elimination of headlight glare.
4. Increase in lane width.
5. Elimination of trapping of pedestrians between opposing streams of traffic.
6. Improved signal timing giving smooth, continuous flow.

Speed and Delay

Traffic movement under one-way street operation as contrasted with two-way operation is considerably smoother and at higher average speeds.

Public reaction to the one-way street system leads us to believe the average driver is more concerned with the number of stops he has to make than with any other single consideration with respect to traffic. He enjoys being able to drive from one end of a one-way street to the other end without a single stop. On the one-way street system this is now possible at all times except during the evening rush hour or when double parking obstructs the free flow of traffic. This achievement is important quantitatively when it is pointed out that about 90 percent of the total traffic is thus benefited.

This smooth, continuous flow is the result of the synchronized traffic signal control system. The signal system imposes some speed control along the arteries and by bunching the traffic in compact groups or platoons, provides gaps for cross traffic and pedestrians at non-signalized intersections.

The results of previously published speed and delays studies on 15th and 16th Streets are repeated as typical of the improvement experienced on a one-way street system. Speed and delay studies were made during both peak and off-peak hours. In making these studies the "floating car" method was used. An observation vehicle was driven so as to "float" with traffic.

Approximately 250 runs were made under one-way and two-way operations.

Average Speeds on 15th and 16th Streets Under One-Way
and Two-Way Operations

	Average Speed MPH		
	<u>Two-Way Operation</u>	<u>One-Way Operation</u>	<u>Percent Change Over Two-Way</u>
Peak Hours (A.M. and P.M.)	12.7	15.8	/ 24.4%
Other Hours	13.3	18.8	/ 41.4%

It is emphasized that the above figures are average overall speeds, i.e., speeds computed by dividing the distance between certain fixed points by the total time required to drive between them. This average speed is not to be confused with speeds of individual vehicles passing a particular point, termed spot speeds. A study of spot speeds at a given midblock location reveals the maximum speed reached by vehicles between inter-sections and, of course, in no way reflects the effect of cumulative delays. Such a spot speed study is of value, however, in determining violations.

There has been some criticism of excessive speeds on the one-way street system and speed checks were made to determine spot speeds under one-way and two-way operation.

Spot Speeds Under One-Way and Two-Way Operation

Location	Average Speed		Pace		Maximum Observed Speed	
	<u>Two-Way Operation</u>	<u>One-Way Operation</u>	<u>Two-Way Operation</u>	<u>One-Way Operation</u>	<u>Two-Way Operation</u>	<u>One-Way Operation</u>
9th between U and V	23 mph	24 mph	22-28 mph	24-30 mph	32 mph	32 mph
16th between F and G	21	23	18-24	22-28	30	32
T between 24th and 25th	23		22-28		36	
F between 24th and 25th		24		24-30		34
Broadway between 40th and 42nd	27		26-32		42	
Capitol between 23rd and 24th	26		24-30		36	
Riverside between Swanston and Robertson	25		22-28		40	

This table indicates that spot speeds on one-way streets are not necessarily higher than when the same streets were two-way and that speeds are as high or higher on representative two-way streets throughout the City.

Effect on Business and Land Values

Contrary to popular claim by individual businesses or business groups, survey data compiled by the State Division of Highways from State Board of Equalization records indicate that one-way streets do not, on the whole, unfavorably affect the gross volume of business transacted. Comparison of the business volume index of the fourth quarter of 1948 and the first and second quarters of 1949 for all businesses in Sacramento County to that of businesses located on one-way streets in Sacramento discounts claims of business loss due to change-over from two-way to one-way streets. In the following table the percentage figures indicate the changes in gross business between a nine month period (fourth quarter of 1947 and first two quarters

of 1948) when two-way traffic was in effect on 16th Street, and a nine-month period (fourth quarter of 1948 and first two quarters of 1949) when one-way traffic was in effect on 16th Street.

	Sacramento County	Sacramento City One-Way Streets
Auto Supply Stores, Garages, Auto Dealers, Service Stations, and Tire Shops	- 4.67%	- 2.9%
Eating and Drinking Places	- 7.18%	- 3.98%
All other businesses	- 0.43%	/ 8.6%
All businesses	- 1.30%	/ 2.09%

This sales tax comparison is shown another way in Figure 3. It is to be observed that the trend of business on 16th Street parallels closely business activity throughout the county.

In an effort to determine the effect of one-way streets on land values questionnaires were mailed in October 1949, to the assessors of 53 cities, comparable to or larger than Sacramento, in which it was asked what effect one-way streets had on valuation of abutting property. Of the 42 cities reporting as having one-way street systems, two indicated an increase in assessed valuation, one a decrease and the 39 others, no effect. Of special interest is the reply of the city of Madison, Wisconsin in which it was stated that in the eight blocks bounded by one-way streets competition among the mercantile organizations to obtain locations in the area is quite severe and has been increasing.

Of the forty-two cities reporting, at least twenty have had one-way streets for five years or more. Of these twenty cities, eight have one-way streets in the residential area, none of which reported a decrease in assessed valuation as a direct result of one-way streets. It would appear, on the basis of reports received from the various cities that the advent of one-way streets has had little, if any, effect on the use of property bordering thereon, whether the property be used for business or residential purposes. It is believed that this conclusion should be carefully studied before acceptance as a general rule.

Judging from requests for information received from many cities throughout the country, such as El Paso, Texas; Omaha, Nebraska; Seattle, Washington; San Diego, California; and Fresno, California, one of the major factors in installing a one-way street system is this fear from local business interests that the system will destroy business. In order to obtain additional data on the effect on business development, a study was made of new building construction and improvements on the Sacramento one-way street system. Records of the City Assessor reveal that since the start of the one-way streets, a total of \$2,730,000 has been spent on new construction and improvements on the streets. Of this amount, \$1,300,000 was for retail stores; \$1,000,000 for office buildings and commercial structures; \$155,000 for gas stations and garages, and \$275,000 for apartment buildings. It would appear that if one-way streets were harmful to all business and commercial activity, there would not have been developments such as these.

Public Acceptance and Approval

The reaction of the community to the one-way street system appears to be that of overwhelming approval. The Board of Directors of the Sacramento Chamber of Commerce by letter commended the City as favoring the exten-

COMPARISON OF TAXABLE GROSS SALES COUNTY-WIDE VS 4TH STREET (C TO Q STREET)

CITY OF SACRAMENTO
TRAFFIC ENGINEERING DEPT

ALL CLASSIFICATIONS OF BUSINESS



EATING AND DRINKING ESTABLISHMENTS



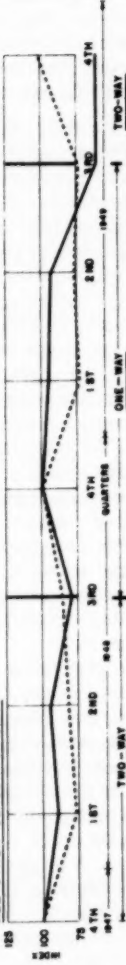
GROCERIES AND MARKETS



SERVICE STATIONS



ALL OTHER CLASSIFICATIONS



DATA FROM STATE BOARD OF EQUALIZATION
COUNTY-WIDE TAXABLE GROSS SALES
CERTIFIED TRUE AND COMPLETE SALES AND
USE TAX RETURN

INDEX
FOURTH QUARTER 1947 SALES
USED AS INDEX 100

RELATION
COUNTY-WIDE
4TH STREET

sion of the present system. The driving public has praised the system by personal letters addressed to both daily newspapers. The Citizens Committee on Truck Traffic, representing truckers and commercial interests, have asked that additional one-way streets be created. The Board of Directors of the Sacramento Retail Merchants Association has gone on record as stating that many of those who originally were opposed to one-way streets before the system was tried out have themselves become strong advocates of this method of handling traffic. This Association has recently advocated the extension of one-way streets to cover all streets in the central business district and is now strongly urging the City Council to adopt their proposal.

Newspaper editorial comment has been strong and frequent in favor of one-way streets. An excerpt from a recent editorial probably sums up the public approval and acceptance: "The overwhelming approval by the citizens of the one-way streets and the suggestions of the Merchants Association and the Chamber of Commerce to extend the plan all point to a feeling of civic wonderment as to how Sacramento ever got along without it."

In closing, it is pointed out that all facts point strongly to the use of one-way streets where warranted and found indicated by appropriate engineering studies. One-way streets are not cure-all and should never be used without proper integration into a master street and highway plan. It is important that the plan be sold to merchants and business groups and that they be given complete information as to the need for the system, the benefits to be gained, and the cost of alternative plans. A sound one-way street plan, with public support, can work wonders in obtaining more efficient use of a congested street system.

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